

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* JUSTIN F. GAYNOR

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Appeal No. 2002-0094  
Application No. 09/346,435

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ON BRIEF

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Before WALTZ, KRATZ, and TIMM, *Administrative Patent Judges*.  
TIMM, *Administrative Patent Judge*.

***DECISION ON APPEAL***

This appeal involves claims 9, 12-23, 25, and 26 as amended after the Final Rejection (Amendment under 37 CFR § 1.116 filed February 14, 2001, Paper No. 10 to be entered as per Advisory Action mailed February 27, 2001, Paper No. 11).<sup>1</sup> These are all the claims pending in the application.

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<sup>1</sup>The Amendment has not yet been physically marked to show entry. Such entry should be effected upon the return of this application to the jurisdiction of the Examiner.

Claims 9, 12-23, 25, and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hause<sup>2</sup> in view of Bothra<sup>3</sup> (Answer at pp. 3-5)<sup>4</sup>. Appellant states that the claims stand or fall separately. We will consider the claims separately in so far as they are argued separately in accordance with 37 CFR § 1.192(c)(8)(2001). We have jurisdiction over the appeal under 35 U.S.C. § 134.

### ***THE CLAIMED SUBJECT MATTER***

Claims 9, 15, and 20 are illustrative of the subject matter on appeal:

9. A method of forming an electronic device comprising the steps of:

forming a patterned dielectric layer comprising a material having a low dielectric constant less than 4.2;

forming an electrical conduction [sic: electrically conductive] sheath layer disposed adjacent to and over the patterned dielectric layer for electrically diverting etchant particles used in a plasma etch process away from the dielectric layer;

forming an electrically conductive interconnect layer by a plasma etch process, said

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<sup>2</sup>U.S. Patent 6,013,574 issued to Hause et al. on January 11, 2000. Hause is available as prior art against the claims as of its effective filing date of January 30, 1996. 35 U.S.C. § 102(e)(2)(2001).

<sup>3</sup>U.S. Patent 5,981,378 issued to Bothra on November 9, 1999. Bothra is available as prior art against the claims as of its filing date of July 25, 1997. 35 U.S.C. § 102(e)(2)(2001).

<sup>4</sup>Wolf et al., 1 *Silicon Processing for the VLSI Era* 542-47 (1986) was relied upon as evidence of obviousness, but was not listed in the statement of rejection. We will confine our review to the combination of Hause and Bothra as it was improper to omit Wolf from the statement of rejection. "Where a reference is relied on to support a rejection ... there would appear to be no excuse for not positively including the reference in the statement of rejection." *In re Hoch*, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970).

electrically conductive interconnect layer disposed adjacent to the electrically conductive sheath layer, said electrically conductive sheath being resistant to the plasma etch process used to pattern the conductive interconnect layer, and

    patterning said electrically conductive interconnect layer by said plasma etch.

15. The method of constructing an electronic device comprising the steps of:

    forming electronic structures outwardly from a surface of a semiconductor layer;

    forming an electrically conductive sheath layer outwardly from the electronic structures for electrically diverting etchant particles used in a plasma etch process away from said electronic structures;

    forming an outer layer outwardly from the electrically conductive sheath layer;

    etching the outer layer with a plasma etch process which generates electrically charged particles in an electric field;

    fixing the semiconductor layer proximate a terminal during the etch process, the terminal providing an electrical bias to the formation of the plasma; and

    routing the electrically charged particles via the electrically conductive sheath layer to the terminal away from the electronic structures between the electrically conductive sheath layer and the terminal by electrically connecting the electrically conductive sheath layer to the terminal.

20. A method of constructing an electronic device comprising the steps of:

    covering an inner layer with a layer of dielectric material;

    depositing an electrically conductive sheath layer outwardly from the dielectric material for electrically diverting etchant particles used in a plasma etch process away from the dielectric layer;

    depositing a photoresist layer outwardly from the said electrically conductive sheath layer;

    patterning the photoresist layer to provide a patterned mask composed of portions of the photoresist layer disposed outwardly from the said electrically conductive layer;

    etching portions of the conductive sheath layer not covered by the patterned mask with an etch selective to the electrically conductive sheath layer relative to the photoresist layer;

etching portions of the dielectric layer not covered by the patterned mask with an etch selective to the dielectric layer relative to the photoresist layer; and

removing the photoresist layer from the electrically conductive sheath layer during a plasma process, the electrically conductive sheath layer providing mechanical and electrical shielding for the dielectric layer.

### ***OPINION***

With respect to claims 9, 12-14, 20-23, 25 and 26, we reverse. We affirm with respect to claims 15-19. In so doing, we note that there are three independent claims, claims 9, 15, and 20, and that each of these claims varies widely from the others in scope.

In order to establish a *prima facie* case of obviousness, the Examiner must show that each and every limitation of the claim is described or suggested by the combination of prior art references or would have been obvious based on the knowledge of those of ordinary skill in the art. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). This holds true for each claim subject to rejection. The errors in the present case arise due to the treatment of claims of differing scope together such that various limitations in particular claims have been overlooked. This becomes apparent upon a review which begins with a consideration of each independent claim separately.

***Claim 9***

Claim 9 requires, among other things, “forming an electrically conductive interconnect layer by a plasma etch process, ... said electrically conductive sheath being ***resistant to the plasma etch process*** used to pattern the conductive interconnect layer, and patterning said electrically conductive interconnect layer ***by said plasma etch***” (emphasis added). According to the specification, the electrically conductive sheath layer is resistant to the plasma etch process when the plasma etch is selective to the material of the electrically conductive interconnect layer. In order to meet the requirements of claim 9, the process must contain a plasma etching step that is selective to the interconnect material relative to the conductive sheath material.

Appellant argues that the above recited step, especially with the specific function recited, is not taught or suggested by either reference alone or in combination (Brief at p. 4). While the Examiner points out that Hause describes patterning an interconnect layer (W layer 28) by an etch process, there are no findings which indicate that the electrically conductive sheath layer (TiN layer 26) is resistant to the etch process (Answer at p. 4). On the contrary, as recognized by the Examiner (Answer at p. 7), the etching of Hause removes both layers (Hause at col. 7, ll. 42-43).

Because the Examiner’s fact finding falls short, we conclude that the Examiner failed to meet the initial burden of establishing a *prima facie* case of obviousness with respect to the subject matter of claim 9. Because claims 12-14 are dependent on claim 9, and include all the limitations thereof, they fall with claim 9.

***Claim 15***

Appellant argues that two steps of claim 15 are neither taught nor suggested by the prior art or any proper combination thereof: (1) the step of forming an electrically conductive sheath layer; and (2) the step of routing the electrically charged particles (Brief at p. 5). We do not agree.

Hause describes a step of forming a TiN layer which meets the requirements of the electrically conductive sheath layer formation step. During patent examination, the pending claims must be "given the broadest reasonable interpretation consistent with the specification." *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). A step of forming a layer is just that; a step of forming a layer of material on a surface. Here, the specification specifies materials including titanium nitride for the conductive sheath layer (specification at p. 6, ll. 30-34). That material is deposited over a dielectric layer 12 and a substrate 10 (*Id.*). The step of forming an electrically conductive sheath layer, therefore, encompasses the formation of a TiN layer over a dielectric layer and a substrate. Nothing in the specification indicates that the function "for electrically diverting..." changes the manipulative aspects of the layer formation step.

Hause describes the formation of TiN layer 26 over a dielectric layer 14 and substrate 10. Hause need not recognize that the layer functions to divert etchant particles during plasma etching; clearly the layer is capable of doing so as it is in the same location and is of the same material as Appellant's layer.

With regard to the routing step, Appellant's broad brush statement that "[n]o such step is taught or suggested by Hause, Bothra or any proper combination of these references" does not adequately address the specific findings and conclusions of the Examiner; particularly, the Examiner's finding that routing as claimed would be inherently accomplished during the etching step of Hause (Answer at pp. 9-10). A reference need not expressly teach or suggest something that inherently occurs during the operation disclosed by the reference. *See In re Best*, 562 F.2d 1252, 1254, 195 USPQ 430, 433 (CCPA 1977)(quoting *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (1971): "[I]t is elementary that the mere recitation of a newly discovered function or property, inherently possessed by things in the prior art, does not cause a claim drawn to those things to distinguish over the prior art."); *In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975)(Merely choosing to describe the process using different terminology does not render the method patentable.); *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948) ("[M]anifestations of laws of nature [are] free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes.").

We note that claim 15 does not require a step of forming dielectric layers much less one made using a low K dielectric material. No teaching of this feature is, therefore, required to meet the claim. Therefore, a discussion of Bothra is unnecessary.

We conclude that the Examiner has established a *prima facie* case of obviousness with respect to the subject matter of claim 15 which has not been sufficiently rebutted by Appellant.

Claim 16 is dependent on claim 15 and further requires that the step of forming electronic structures comprises the step of forming a dielectric layer comprising a material having a low dielectric constant. The Examiner finds that Hause describes forming a dielectric layer (14) and acknowledges that this layer is not disclosed as having a low dielectric constant as claimed. The Examiner, however, finds that Bothra teaches both the required low dielectric constant material and a motivation for its use in layers with interconnect via structures, i.e., to reduce via resistance (Answer at p. 4; citing Bothra at col. 1, ll. 39-43). On this basis, the Examiner concludes it would have been obvious to one of ordinary skill in the art at the time of the invention to have used a low dielectric material in dielectric layer (14) of Hause to reduce via resistance (Answer at p. 4).

With regard to claim 16, Appellant argues that “no such combination is taught or suggested by Hause, Bothra or any proper combination of these references.” (Brief at p. 6). While this broad brush statement does not alone adequately address the Examiner’s specific findings of fact and conclusions of law, we note that Appellant made much more specific arguments in addressing a similar limitation in claim 9. We will, therefore, look to the arguments made in connection to claim 9.

Appellant points out that the use of low dielectric material has a definite purpose in the process of the claims since it is the low dielectric material which is being protected. On that basis, Appellant argues that there is no reason to substitute the dielectric of Bothra for the dielectric of Hause (Brief at pp. 3-4).



We agree with the Examiner that, in view of Bothra, one of ordinary skill in the art would have found it obvious to select a low dielectric material for use in the dielectric layer of Hause. Bothra expresses a specific reason for using such a material in dielectric layers with interconnect via structures. That is enough to establish the obviousness of the combination. *See In re Kemps*, 97 F.3d 1427, 1430, 40 USPQ2d 1309, 1311 (Fed. Cir. 1996)(The motivation in the prior art to combine the references does not have to be identical to that of the applicant to establish obviousness.); *In re Beattie*, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992)(It is enough that some reason, suggestion or motivation exists in the prior art taken as a whole for making the combination.).

With regard to claims 17-19, which are dependent on claim 15, Appellant again simply recites each claim limitation and states that “[n]o such combination is taught or suggested by Hause, Bothra or any proper combination of these references.” (Brief at p. 6). Such a broad brush statement does not sufficiently counter the specific findings and conclusions of the Examiner (Answer at pp. 4-5 and 10-11). For instance, such an argument does not sufficiently call into question the Examiner’s findings that: (1) the forming step of claim 17 is suggested by Hause because the materials formed are the same (Answer at p. 5); (2) routing of etchant particles inherently occurs in the process of Hause (Answer at pp. 7-8); and the filled via (via 22 filled with tungsten) of Hause is a conductive via as required by claim 19 (Answer at pp. 4 and 11).

We conclude that the Examiner has established a *prima facie* case of unpatentability with respect to the subject matter of claims 15-19 which has not been sufficiently rebutted by Appellant.

***Claim 20***

Claim 20 is directed to a second embodiment of the invention as shown in Figure 2. That embodiment involves depositing and patterning a photoresist layer over the conductive sheath layer and etching the uncovered portions of the conductive sheath layer and underlying dielectric layers in two selective etching steps. The photoresist is removed from the electrically conductive sheath layer using a plasma process.

Appellant argues that the step of removing the photoresist layer from the electrically conductive sheath layer during a plasma process is not taught or suggested by the references or their combination (Brief at p. 7). Although claim 20 is directed to a different embodiment than claims 9, 15 and 16 and has steps of depositing and patterning photoresist over the conductive sheath layer, claim 20 was grouped with claims 9, 15, and 16 for purposes of setting forth findings of fact (Answer at p. 4). The rejection contains no findings with respect to the steps of depositing, patterning and removing the photoresist layer as recited in claim 20. We, therefore, are constrained to reverse with respect to the rejection of claims 20-23, 25, and 26.

***CONCLUSION***

To summarize, the decision of the Examiner to reject claims 9, 12-14, 20-23, 25, and 26 under 35 U.S.C. § 103(a) is reversed, but the decision of the Examiner to reject claims 15-19 is affirmed.

AFFIRMED-IN-PART; REVERSED-IN-PART

THOMAS A. WALTZ	)	
Administrative Patent Judge	)	
	)	
	)	
	)	
	)	BOARD OF PATENT
PETER F. KRATZ	)	APPEALS
Administrative Patent Judge	)	AND
	)	INTERFERENCES
	)	
	)	
	)	
CATHERINE TIMM	)	
Administrative Patent Judge	)	

CT/jrg

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TEXAS INSTRUMENTS INCORPORATED  
P O BOX 655474, M/S 3999  
DALLAS, TX 75265